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AUTHOR Pepper, Kaye
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ABSTRACT

This study examined whether there was a difference in the attitudes toward computer use of preservice and inservice teachers. The Computer Literacy Attitude Survey, a survey which reflected attitudes toward computer use, was administered to 50 preservice teachers enrolled in a 10-week instructional technology course and 30 inservice teachers enrolled in two 10-week instructional technology courses. The courses were systematically planned to teach the use and understanding of computer technologies in an educational setting. The courses included background information about computers and hands-on experience. Participants completed the Computer Literacy Attitude Survey before the course began and again at the end of the course to determine whether a systematically designed computer course might influence their attitudes. Data analysis indicated that the course did influence the attitudes of preservice and inservice teachers. There were differences in the attitudes of the preservice and inservice teachers as they entered the classes. Preservice teachers were influenced more positively than were inservice teachers. (Contains 18 references.) (SM)

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A Comparison of Attitudes toward Computer Use of Preservice and Inservice Teachers

Dr. Kaye Pepper
University of Mississippi

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Biography

Dr. Kaye Pepper, Assistant Professor in Curriculum and Instruction at the University of Mississippi, earned a Doctor of Philosophy from Mississippi State University. Prior to coming to the University of Mississippi, Dr. Pepper taught instructional technology courses at Louisiana Tech University, worked as an elementary principal, and held the position of Curriculum Director with the Choctaw Tribal Schools in Philadelphia, Mississippi. She served as Legislative Monitor for the Mississippi PTA and supervised student teachers in Albuquerque, New Mexico. Journal articles include: "Establishing Research-Based Knowledge in Teacher Education" in the Journal of Research and Development in Education, Spring, 1999 and "The Development of an Evaluation Model to Establish Research-Based Knowledge about Teacher Education" in Studies in Educational Evaluation (in press).

Dr. Kaye Pepper
University of Mississippi
School of Education
University, MS 38677
Phone (662) 915-7618
Fax (662) 915-5376
Email kpepper@olemiss.edu

Abstract

This study was conducted to determine whether there was a difference in the attitudes toward computer use of preservice and inservice teachers. A survey which reflected attitudes toward computer use was administered before instructional technology classes and again at the end to determine whether a systematically designed computer course may influence attitudes of the participants. The results of this study will provide important information concerning the differences in preservice and inservice teachers' attitudes toward computer use that will assist those responsible for planning technology training.

Computer use in the United States continues to become more and more a part of our everyday lives. Many believe that for students to survive in today's information oriented culture, it will be necessary for them to have the skills which will facilitate computer use. A key factor in determining whether students gain the necessary knowledge and skills to use technology lies with the ability of teachers to effectively incorporate technology into classroom instruction. This study was conducted to determine whether there was a difference in the attitudes toward computer use of preservice and inservice teachers. A survey which reflected attitudes toward computer use was administered before instructional technology classes and again at the end to determine whether training may alter attitudes of the participants. The results of this study will provide important information concerning the differences in preservice and inservice teachers' attitudes toward computer use which will assist those responsible for planning technology training.

Expectations of Technology Use

In President Clinton's State of the Union Address to Congress in January, 1996, he stated, "Nothing is more critical to preparing our public schools for the 21st century than ensuring they have the modern technology to prepare students for the information age" (p. 2). The President has challenged the nation to work together in a major effort to help every student become technologically literate for the 21st century. The President has set four goals to assist in accomplishing this task. These goals are: (1) provide access to modern computers for all teachers and students, (2) connect every school in America to the Information Superhighway, (3) develop effective software in all subject areas, and (4) give every teacher the development they need to help students use and learn through technology (Clinton, 1996).

In light of the goals set by President Clinton and the ever-increasing use of technology in the workplace, it is vital that today's teachers are skilled in using technology and are able to effectively incorporate technology into classroom instruction. Several additional factors have assisted in setting the expectation that today's K-12 teachers possess the ability to utilize instructional technology, particularly computer-based technologies. These factors include: (1) the

need to provide relevant and authentic instruction that reflects comtemporary and future social and economic demands on students, (2) the compatability of certain computer-based technologies with newer, research-based approaches to teaching and learning, (3) student and parent expectations, and (4) guidelines and mandates from federal, state, district, and professional bodies (Abdal-Haqq, 1995).

Lack of Technology Use

Despite these expectations, a number of investigations into computer classrooms have concluded that computer-based technologies are not being used effectively by the majority of teachers. The literature suggested that: (1) relatively few teachers routinely use computer-based technologies for instructional purposes, (2) when computers are used, they are generally used for low-level tasks such as drill and word processing, and (3) computers are not sufficiently integrated across the K-12 curriculum (Abdal-Haqq, 1995).

The most common reasons given for the low level of computer use in schools are (1) limited access to equipment and (2) lack of training. A number of studies and reports reveal than both new and veteran teachers feel inadequately prepared to use computers in their classroom (AACTE, 1987; Bosch & Cardinale, 1993; Topp, Mortensen, & Grandgenett, 1995). In a survey of recent graduates, the Office of Technology Assessment found that while more than half reported being prepared to utilize drill and practice, tutorials, games, word processing and publishing applications; less than 10% felt competent to use multimedia and presentation packages, electronic network collaboration capabilities, or problem-solving applications (Office of Technology Assessment, 1995).

The National Center for Educational Statistics found that teachers are being asked to learn new methods of teaching, while at the same time they are facing the greater challenges of rapidly increasing technological changes and greater diversity in the classroom. Although many educators and policy analysts consider educational techology a vehicle for transforming education, only 20% of the teachers reported feeling well prepared to integrate educational technology into classroom instruction. Seventy-eight percent of the respondents reported that

they had participated in professional development based on technology within the last year; however, only 23% of those felt very well prepared (National Center for Educational Statistics, 1999).

Reasons for Lack of Use

Many teachers have already formed pre-conceived notions of the computer as a difficult, impersonal machine that may never be mastered. Even those teachers who have a favorable attitude towards the use of the computer have not necessarily moved towards using the computer in their classrooms. A large part of this problem is the result of not having the knowledge to use the machine, and not having any knowledge of or expertise with computer-based and computer-managed instruction. (Okinaka, 1992)

There are other major concerns which have caused teachers to shy away from computer use. The difficulty of learning how to use the computer and the associated amounts of time that must be devoted are further deterrents. Because teachers are aware of the complexity of the computer and the time required to master these systems, there is sometimes a great deal of fear where computer use is concerned. Many teachers feel threatened by the prospect of having to learn a subject that is completely foreign. Furthermore, the prospect of having to teach a class using a device that has not been mastered can be quite intimidating. Many professionals do not feel comfortable teaching in an area where their students might have more ability and experience (Okinaka, 1992).

The real problem lies in the fact that teachers who are interested in using the computer are more likely to be those who already have some computer experience--whereas those who have no knowledge of the machine are more hesitant. The question of how to motivate this portion of the teaching population is a key issue--especially since there are many teachers in the modern workforce who have never had experience in using the computer. Results of one study (Okinaka, 1992) indicated that teachers' attitudes towards computers are affected more favorably when (1) an understanding as to how computers can be used most effectively is achieved and (2) when

teachers are informed about the power of computers in the classroom. Education and exposure would appear to be key issues in the area of stimulating computer use.

Kinzie and Delcourt (1991) found that teachers who use computer technology are likely to be important models for their students, helping to produce positive student attitudes towards these technologies. In order to do this, however, they must feel self-efficacious and comfortable using technologies and they must realize the advantage of doing so. It is likely that teacher attitudes are strongly influenced by their prior training. These outcomes suggest that strategies to enhance teacher experience with computer technologies could contribute to the formation of positive attitudes and self-efficacy, and in this way positively influence teacher adoption, use, and modeling of computer techologies.

Though requiring coursework and providing inservice opportunities are positive steps toward encouraging teachers to take advantage of the technology available to them, research has shown that significant numbers of teachers are computer anxious and that this anxiety interferes with their ability to integrate technology in their classroom teaching. Therefore, it is important that education computing classes for classroom teachers be taught in a manner which reduces computer anxiety and fosters computer confidence and at the same time provides experience with and knowledge about the computer (Hunt & Bohlin, 1991).

Preservice Teacher Concerns

Not only is there concern about computer use of teachers who are already in classrooms, but there is also concern about training preservice teachers in the effective use of computers in instruction. Hunt and Bohlin (1991) concluded that student attitudes toward working with computers are important indicators of the ways in which students will use computers when they become teachers in their own classrooms.

Further, Hunt and Bolin (1991) found that previous computer experiences correlate highly with student attitudes towards using computers. These positive relationships would indicate that these earlier experiences were generally successful ones in which the student felt a sense of accomplishment. However, the vast majority of these experiences were word processing

and recreational games. Key findings concluded that students enter instructional technology classes with a wide range of experience using computers and that these previous experiences are the best predictors of student attitudes. A finding of particular importance to teacher educators was that these students generally agreed that the ability to use computers was a useful skill for living in today's society and they had positive attitudes toward using computers; however, many did not see that they needed a firm mastery of the computer for their future work as educators (Hunt & Bohlin, 1993).

Because preservice teachers enter classes with differing levels of experience and abilities, instructors should be sensitive to differences in students' incoming attitudes and needs. McInerney, McInerney, and Sinclair (1994) found that significantly higher levels of computer anxiety have been found in students of "artistic" and "social" vocational personality types. Included in this group are those enrolled in education and humanities courses. Preservice students in elementary education seemed to have particularly high levels of computer anxiety. Self concerns involving uncertainty and self adequacy in coping with the demands of the innovation were among the highest rated areas of concern. It is evident therefore that future teachers must be comfortable with instructional techology both to facilitate their delivery of education and to assist their students in gaining computer competence.

Thus it is important that computing classes for preservice teachers be taught in a manner in which the students have many opportunities to work with the computers and that they find these experiences to be successful and interesting. Further, instructors of computing classes for teacher education students must be careful that their students see a direct connection between what they do in class and what they will do in their K-12 classrooms. This can be done by modeling effective instructional strategies, using exercises which exemplify instructional tasks and frequently relating the class activities to real-world events in instructional settings (Hunt & Bohlin, 1991).

Training Teachers for Effective Use of Technology

Well-trained teachers are the key to effective use of technology. Teachers are the critical factor in successful implementation of technology in the schools. This means not only teachers currently in the schools but also our future teachers. Research says experience with and knowledge about computer technologies are crucial to the effective use of the computer in the classroom. Based on the belief that attitudes toward computer technologies may influence their effective and innovative use, one study (Savenye, 1993) indicated that a systematically designed computer literacy course did improve the attitudes of preservice teachers.

The present study was conducted with three questions in mind: 1) are the incoming attitudes of preservice and inservice teachers the same toward computer use in the classroom, 2) will a systematically designed computer course influence attitudes toward computer use of preservice and inservice teachers, and 3) how can knowledge of attitudes toward computer use assist in planning courses/training for preservice and inservice teachers?

Method

The subjects were 50 preservice teachers enrolled in a ten-week introductory instructional technology course and 30 inservice teachers enrolled in two ten-week courses, one based on word processing skills and one related to the use of the internet to enhance instruction. A limitation of this study was that the preservice teachers were enrolled in a required class and the inservice teachers were enrolled in graduate courses taken to complete a masters degree or because they were simply interested in learning more about computers.

The computer courses were systematically planned to teach the use and understanding of computer technologies in an educational setting. Background information about the computer was covered, as well as a great deal of hands-on experience and opportunities to effectively incorporate technology into classroom instructional planning. The same instructor planned and taught all three courses. The Computer Literacy Attitude Survey (described below) was administered as a pre- and post-course survey to all participants to determine whether instruction in the courses influenced computer attitudes of the preservice and inservice teachers. The results

of the Computer Literacy Attitude Survey were also used to determine differences in attitudes of the two groups.

Data Sources

Forty-nine preservice and twenty-nine inservice teachers completed the Computer Literacy Attitude Survey as a pre-test. Forty-six preservice and 30 inservice teachers completed the Computer Literacy Attitude Survey as a post-test. The survey was developed by Savenye (1993) and consisted of fifty Likert-scale type items. The survey was derived from several sources (Abdel, et al., 1986; Bannon, Marshall, & Fluegal, 1985; Ellsworth & Bowman, 1982; Smith, 1987; and Violato, Marini, & Hunter, 1989). The survey contained items related to the factors of liking of computers; valuing computers for society and for education; anxiety about using computers; confidence with regard to learning about computers; and perceptions of gender appropriateness of computers. Students were asked to rate the items on a scale from one to five which corresponded to the choices of strongly agree, agree, not sure, disagree, and strongly disagree, respectively. Students also completed a brief questionnaire regarding demographic characteristics and previous computer experience.

Data Analysis

Demographic information was collected on the preservice and inservice teachers. This information included items such as: years of experience as a teacher, grade level they were teaching, degrees held, previous computer classes taken, and experience using computers. Participants were provided categories from which to choose an answer for each item. Frequencies were calculated for their responses. From the frequencies, percentages of responses were calculated. Participants were also asked to rate their skill in typing and percentages were calculated.

For the fifty Likert-scale questions regarding the preservice and inservice teachers' attitudes toward computer use, percentages of responses for the pre- and post- course surveys were calculated. The percentages of responses were used to compare attitudes at the beginning and at the end of the course for each category. The Pearson Chi Square test was used to analyze

differences between specific items within each category. These Pearson Chi Square tests were run in the following instances: preservice teacher pretest/posttest, inservice teacher pretest/posttest, pretest preservice teacher/inservice teacher, and posttest preservice teacher/inservice teacher.

Results

A summary of the characteristics of the preservice teachers is represented in Table 1.

Gender?	Male 16 (33%)	Female 33 (67%)			
Year in Ed Prog?	Fresh 3 (6%)	Soph 23 (47%)	Junior 18 (37%)	Senior 5 (10%)	
Major?	Educ 44 (90%)	Other 5 (10%)			
Area of Interest?	Elem 19 (39%)	Sec 30 (61%)			
Prev Ed Courses?	None 11 (22%)	1-2 30 (61%)	3-4 4 (8%)	5-6 2 (4%)	>6 2 (4%)
Prev Exp w/Comp?	None 6 (12%)	Few Days 3 (6%)	1-6 mons 10 (20%)	7-12mons 4(8%)	>1yr 26(53%)
Own/Access-Comp?	Yes 41(84%)	No 8 (16%)			
Courses in Comp?	Yes 30 (61%)	No 19 (39%)			
Typing Skills?	Nonexist 1(2%)	Poor 10 (20%)	Good 35 (71%)	Excell 3 (6%)	

Table 1: Characteristics of the preservice teachers

Two-thirds of the preservice teachers were female. Students appeared to to have enrolled in the computer course at varied points in their college careers with 84% being sophmores and juniors. The majority of the preservice teachers were education majors with 61% of the respondents being in secondary education. Eighty-three percent of the preservice teachers had had two or fewer education classes. Fifty-three percent of the respondents had more than a year of experience with computers and over half the preservice teachers had had prior courses in the use of computers. The majority of the students (71%) rated their typing skills as good.

A summary of the characteristics of the inservice teachers is represented in Table 2.

Gender?	Male 2 (7%)	Female 27 (98%)			
Yrs of teaching?	0-5 10 (34%)	6-10 5 (16%)	11-15 3 (10%)	16-20 4 (13%)	>20 8 (27%)
Area of Interest?	Lang 6 (20%)	Math 2 (7%)	Sci 1 (3%)	Soc St 4 (13%)	Other 16 (55%)
Grade Level?	Elem 18 (62%)	Sec 11 (38%)			
Prev Ed Courses?	None 1 (3%)	1-2 1 (3%)	3-4 1 (3%)	5-6 1 (3%)	>6 25 (88%)
Pre Exp w/Comp?	None 4 (13%)	Few days 3 (10%)	1-6 mons 5 (17%)	7-12 mon 5 (17%)	>1yr 12 (43%)
Own/Access-Comp?	Yes 24 (84%)	No 5 (16%)			
Course in Comp?	Yes 24 (84%)	No 5 (16%)			
Typing Skills?	Nonexist 0 (0%)	Poor 8 (27%)	Good 15 (52%)	Excell 6 (20%)	

Table 2: Characteristics of the inservice teachers

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Ninety-eight percent of the inservice teachers were female, with the majority of the respondents either having five or less years of experience (34%) or over 20 years of experience (27%). The areas of interest indicated that a large portion of the respondents (55%) were in fields not typical to regular content areas. Knowledge of the instructor reported that these inservice teachers were in areas such athletics and wellness or special education. Sixty-two percent of the inservice teachers were elementary teachers. Four of the respondents indicated that they had had six or fewer education classes. This is explained in the fact that some of the inservice teachers were instructors in health and wellness programs. Forty-three percent of the respondents indicated having more than one year of experience with computers. The majority of the participants owned or had access to a computer and had had a prior course in the use of computers. Over half the inservice teachers felt that their typing skills were good with 20% indicating that their typing skills were excellent.

Table 3 represents the results on all 50 Computer Literacy Attitude Survey items. Items on the survey were assigned to the following categories (Savenye, 1993): liking of computers, anxiety, value of computers to society and to education, confidence about learning about computers and using computers, and perceptions of gender-appropriateness of computer use. The percentage of responses which indicated a positive attitude toward computers were calculated for each category. Table 3 reveals those percentages.

	PRESERVICE TEACHERS		INSERVICE TEACHERS	
CATEGORIES OF ITEMS	PRETEST	POSTTEST	PRETEST	POSTTEST
Liking of Computers	69	67	80	75
Value of Computers to Society	76	76	82	77
Value of Computers to Education	61	69	74	70
Confidence about Learning about Computers	88	94	90	92
Confidence about Using Computers	67	83	69	70
Anxiety about Computers	77	83	73	80
Gender Appropriateness	89	85	92	89

Table 3: Percentages of responses indicating a positive attitude toward computers in each category

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Preservice Pretest/Posttest Results

As shown in Table 3, attitudes towards computers by preservice students at the beginning of the course, as indicated by responses on the 50-item survey, were generally positive. The most positive attitudes were found in the categories of Confidence about Learning about Computers and Gender Appropriatness. The categories showing a high percentage of least positive attitudes were Value of Computers to Education, Confidence about Using Computers, and Liking of Computers.

It is interesting to note particular concerns in each of these categories. In Value of Computers to Education, the item which showed the highest percentage of least positive responses was "I will use my knowledge of computers as a teacher". Another item which showed a low percentage of positive responses indicated that if students don't have the opportunity to learn about computers, they will be illiterate and deprived. Additional items of interest indicated that preservice teachers generally felt that the use of the computers in the classroom would decrease the amount of interaction between the student and teacher and that it would isolate students from one another.

When considering the preservice students' Confidence about Using Computers, the major concern as indicated by the highest percentage of least positive responses appeared to be that they did not feel they could do as well on the computer as their peers. In the Liking of Computers category, the percentage of preservice teacher responses were the least positive on items which stated that "Once I begin working on a computer, I find it hard to stop; If a problem is left unsolved, I think about it after class;" and "I stick with a computer problem until I solve it."

On the posttest survey, preservice teacher attitudes were again generally high. Two categories which showed the highest percentage of least positive responses were Liking of Computers and the Value of Computers to Education. These categories were less positive on the pretest as well. The same items received the highest percentage of least positive responses as on the pretest for the Liking of Computers category. One additional item showed concern in the

Value of Computers to Education category. Preservice teachers seemed to feel more strongly that computers detract from the real problems of teachers at the completion of the course.

The Pearson Chi Square test was conducted on items within each category to determine whether there was a significant difference in preservice teacher attitudes on the pretest/posttest administration. There was a significant difference on two items. In the Value of Computers to Education category, a statistically significant relationship was found for the item "I will use my knowledge of computers as a teacher" ($\chi^2 = 46.67$, df = 1, p = .00). In addition, in the Confidence About Using Computers category, a statistically significant relationship was found for the item "I do as well on the computer as my peers" ($\chi^2 = 6.26$, df = 1, p = .01). Only two preservice teachers responded positively to this item on the pretest, whereas 65% of the inservice teacher responded positively.

Inservice Teachers Pretest/Posttest Results

Again referring to Table 3, the inservice teachers indicated generally positive results on the pretest administration of the survey. The three categories which showed highest percentage of least positive attitudes included: Confidence about Using Computers, Anxiety about Computers, and the Value of Computers to Education. Noting particular items of concerns in two of these categories are of interest. In Anxiety about Computers, inservice teachers indicated that they were nervous about using computers. In Value of Computer to Education, inservice teachers indicated highest percentage of least positive responses in the areas of: using their knowledge of computers as a teacher, that it is important to be able to use computers to get a teaching job, the computer will deny students the opportunity to reason with others, decrease the amount of interaction between the student and teacher, and the use of computers will isolate students from one another.

The posttest administration results for the inservice teachers indicated concerns in four categories: Liking of Computers, Value of Computers to Society and to Education, and Confidence about Using Computers. Areas of concern in the Liking of Computers category showed that inservice teachers showed the highest percentage of least positive responses when

asked items which indicated that once they started to use the computer, they found it hard to stop; a job using the computer would be interesting; and they would stick with a computer problem until they had it solved. In the Value of Computers to Society, inservice teachers indicated the most concern in the belief that computers were gaining too much control over our lives. In the Value of Computers to Education, inservice teachers indicated the most concern in items that indicated that they would use their knowledge of computers as a teacher, that it is important to be able to use a computer to get a teaching job, that students who have no opportunity to learn about computers would be illiterate and deprived, the computer creates too much additional work for teachers, and it would decrease the amount of interaction between the teacher and students.

The Pearson Chi Square test was conducted on items within each category to determine whether there was a significant difference in inservice teacher attitudes on the pretest/posttest administration. One item indicated a significant difference. In the Value of Computers to Education category, a statistically significant relationship was found for the item "Without computer training, the students will be deprived and illiterate." ($\chi^2 = 3.83$, df = 1, p = .05). Interestingly, the inservice teachers felt more positively about this item on the pretest rather than on the posttest administration.

Pretest Preservice/Inservice Results

Looking at Table 3, it is interesting to note the percentages of positive responses for the categories on the pretest administration as they relate to the preservice and inservice teachers. Generally, the inservice teachers displayed more positive attitudes on the pretest administration than the preservice teachers. The preservice teachers responded only slightly more positively in the category Anxiety about Computers than the inservice teachers.

The Pearson Chi Square test was conducted on items within each category to determine whether there was a significant difference in preservice and inservice teacher attitudes on the pretest administration. Several items indicated a significant difference. Table 4 displays these results. It is interesting to note that on all items except one, the inservice teachers appeared to be

more positive than the preservice teachers on the pretest administration. Preservice teachers were more positive on the item which indicated that it would be important to be able to use a computer to get a teaching job.

Category/Item	χ^2	df	Significance Level
Liking of Computers			
If problem left unsolved, would continue to think about it later.	5.44	1	.020
Value of Computers to Education			
I will use my knowledge of computers as a teacher	34.9	1	.000
It is important to be able to use computers to get a teaching job.	8.02	1	.005
With no computer knowledge, students will be illiterate and deprived.	4.30	1	.038
Computers improve learning and higher order thinking skills.	4.01	1	.045
Computers deny students the opportunity to reason with others	6.64	1	.010
Value of Computers to Society			
Computers are gaining too much control over our lives.	3.95	1	.047

Table 4: Pearson Chi Square test results for Pretest Administration to Preservice/Inservice Teachers

Posttest Preservice/Inservice Results

To investigate the percentages of positive responses for the categories on the posttest administration as they relate to the preservice and inservice teachers, again refer to Table 3. It appears that the percentages for the categories are more equal on the posttest administration. The preservice teacher percentages rose in four of the categories and remained the same or went down slightly in three categories. The inservice teacher percentages indicating positive responses fell in five categories, rose slightly in two categories, and rose seven percentage points in the category Anxiety about Computers.

The Pearson Chi Square test was conducted on items within each category to determine whether there was a significant difference in preservice and inservice teacher attitudes on the posttest administration of the Computer Literacy Attitude Survey. Three items indicated a significant difference in the posttest administration. In the Liking of Computers category, a statistically significant relationship was found for the item "Once I start to work with computers, I find it hard to stop." ($\chi^2 = 6.41$. df = 1, p = .011). A statistically significant relationship was also found for the item "I stick with a problem with a computer program until it is solved." ($\chi^2 = 4.85$,

df = 1, p = .028). In the Value of Computers to Society category, a statistically significant relationship was found for the item "Computers are gaining too much control over our lives." (χ^2 = 4.98, df = 1, p = .026. Again, it appears that the inservice teachers appear to be more positive on these items than the preservice teachers.

Discussion

This study was conducted to answer three questions: 1) are the incoming attitudes of preservice and inservice teachers the same about using computers, 2) will a systematically designed computer course influence attitudes toward computer use of preservice and inservice teachers, and 3) how can knowledge of attitudes toward technology assist in planning courses/training for preservice and inservice teachers? The results of the Computer Literacy Attitude Survey provide important information in response to these questions.

Incoming Attitudes of Preservice/Inservice Teachers

The results of the study indicated that there were differences in the attitudes of the preservice and inservice teachers as they entered the classes. As indicated in Table 3, the inservice teacher attitudes toward computer use on the pretest administration were more positive than the preservice teachers in all categories but one, Anxiety about Computers. The literature indicates that inservice teachers were not raised in the computer age and therefore older teachers are usually more anxious about using computers (Okinaka, 1992). Even though the inservice teachers were slightly lower than the preservice teachers, seventy-three percent of the inservice teachers indicated a positive attitude in the Anxiety about Computers category. The fact that the inservice teachers reported such a high percentage of positive attitudes may be due to the fact that the inservice teachers were taking the course on a volunteer basis. The inservice teachers had determined that it would be important for them to learn about the computer. Their attitudes are possibly not reflective of the general inservice population.

There was a significant difference in the attitudes of preservice and inservice teachers on seven items on the pretest as indicated on Table 4. The majority of those items were related to the Value of Computers to Education category. Demographic information indicates that 50% of

the preservice teachers enrolled in the instructional technology course were freshmen and sophmores. Eighty-three percent of the students had had two or fewer education courses. This may account for the differences in these responses. It clearly indicates that these students are in need of instruction in this area, whereas the inservice teachers are possibly more aware because of their experience in the classroom.

Two other areas where there are significant differences between the preservice and inservice teachers indicated that the respondents would continue to think about an unsolved computer problem and the idea that computers are gaining too much control over our lives. The inservice teachers indicated more positive responses for both of these items.

Computer Course Influence Attitudes Toward Computer Use

Question two seeks to determine whether a systematically designed computer course would influence attitudes of preservice and inservice teachers. The attitudes of the preservice and inservice teachers were influenced by the course. The preservice teachers were generally more positive at the end of the course than the inservice teachers. Attitudes in four categories had improved for the preservice teachers, in one category attitudes remained the same, and on two categories the attitudes declined. The two catgories in which attitudes declined were Liking of Computers and Gender Appropriateness.

Savenye (1993) also found that attitudes in the Liking of Computers category declined and suggested that perhaps at the end of the course, students were tired and not feeling as positive about using the computer. Items on the survey that showed the least positive attitude included wording which indicated the desire to continue working on a computer problem that was difficult to solve. In the category of Gender Appropriateness, preservice teachers indicated that computers were more important and more enjoyable for males than females. Female students indicated during the course that it just seemed easier for the males to learn how to use the computers.

Of particular note in the category of Value of Computer to Education, on the pretest 92% of the students indicated that they would not use their knowledge of computers as teachers. On

the posttest, however, only one student indicated that he/she would not use the computer as a teacher.

As indicated by the Pearson Chi Square test, there were some significant differences in attitudes toward computer use from the pretest/posttest comparisons. Preservice teachers indicated that a statistically significant relationship was found for the items stating that they would use their knowledge of computers as a teacher and also that they felt confident they could do as well as their peers on the computer. Knowledge of how computers can be effectively used in the classroom and experience using computers are the two areas noted in the literature in which the teachers need the most assistance.

Attitudes of the inservice teachers were less positive at the end of the course in four categories: Liking of Computers, Value of Computers to Society, Value of Computers to Education, and Gender Appropriateness. Decline in positive attitudes in Liking of Computers indicated that teachers were less likely to think about a computer problem that they were not able to solve and that they did not look forward to using the computers in school. In the category Value of Computers to Society, the responses indicated more uncertainty as to whether computers were gaining too much control over our lives. In the Value of Computer to Education, inservice teachers were less positive than before about the effects of computer use in the classroom. The inservice teachers were less positive at the end of the course that females could do as well as males on the computer. It was indicated by several inservice teachers at the end of the course that now they realized that computers required more work than they had anticipated. It would take a great deal of their time to incorporate technology into their instruction and they are already finding that they do not have enough time to do the things required of them in the classroom.

As indicated by the Pearson Chi Square test, there was one item which showed a significant difference in attitudes toward computer use from the pretest/posttest comparisons for the inservice teacher. Inservice teachers indicated that a statistically significant relationship was found for the item which stated that students with no computer experience would be deprived

and illiterate. The percentage of responses for inservice teachers showed more negative responses after the course rather than before. The reason for this decline is unclear.

In comparing posttest responses of preservice and inservice teachers, the Pearson Chi Square test indicated three items in which a statistically significant relationship was found. These items indicated that if a computer problem remained unsolved, the respondents would continue to think about it and that they would stick with a computer problem until it was solved. The item which stated that the respondents felt computers were gaining too much control over our lives also indicated a statistically significant relationship. These items possibly indicate that the respondents now have more experience with computers and feel more confident that they can solve problems that occur. They also appear to be more aware that computers are now handling more and more of the everyday business that effects our lives.

Knowledge of Computer Attitudes to Assist in Planning Courses/Training

This study indicates that the preservice teachers had more positive attitudes at the end of their computer course than did the inservice teachers. This leads to question three which seeks to determine how knowledge of teacher attitudes toward computer use can assist in planning for preservice and inservice courses/training. By studying the results of the pretest and posttest administration of the survey, it is important to note the areas of improvement and decline in attitudes. Preservice teachers had large increases in positive attitudes in the areas of: Value of Computers to Education, Confidence about Using Computers, Confidence about Learning about Computers, and Anxiety about Computers. The decline in the category of Liking of Computers may be explained by the fact that the students had just completed the course and were tired of the topic of computers. Areas to pinpoint for the instructor would be in the categories of Value of Computers to Society and Gender Appropriateness. More information in the value of computers to society could improve attitudes here. Also, more assistance to females may increase their confidence in using computers, which in turn may improve their attitudes.

There was a decline of positive attitudes in four categories for the inservice teachers: Liking of Computers, Value of Computers to Society, Value of Computers to Education, and

Gender Appropriatenss. In addition, there was little gain in two others: Confidence about Learning about Computers and Confidence about Using Computers. Because of these declines, the instructor of the courses needs to take a close look at the materials and also the methods used for instruction to determine areas for improvement. Looking at individual items in each category as indicated above may assist in determining needs for improvement of the course. More specifically, the instructor should attempt to determine if certain methods of instruction are more appropriate for inservice teachers. However, as mentioned before, one reason for the decline may be the realization of the inservice teachers that incorporating technology in the classroom does create more or different kinds of work for the teacher. With more experience and knowledge of how to effectively incorporate technology into classroom instruction, the attitudes may improve.

Conclusion

National trends have indicated that there is a call for increased use of technology in schools to prepare our students for the future. Well-trained teachers are the key to effective use of technology. This study was based on the assumption that teacher success in using technology is partially dependent upon their attitudes toward technology. This study indicated that a systematically designed computer course did influence attitudes of preservice teachers, as found in a previous study (Savenye, 1993) and inservice teachers. It appears from this study that preservice teachers were influenced more positively than inservice teachers. Information gained from the results may be used to plan for future classes/training. Understanding the attitudes of participants will definitely assist course/training planners in determining what materials and methods of instruction to include. This will provide participants a much more positive experience in their quest to effectively include technology in their classroom instruction.

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